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QUARTERLY PROGRESS REPORT

1 April 1965 - 30 June 1965

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The **RAND** Corporation
SANTA MONICA • CALIFORNIA

QUARTERLY PROGRESS REPORT

1 April 1965 - 30 June 1965

(Principal Investigator: Ernest M. Scheuer)

DESCRIPTION

Under the terms of this Contract, RAND is conducting studies of reliability assessment for the Apollo Reliability and Quality Office, Headquarters, NASA. The work is divided into three major areas of investigation: (1) estimation of reliability growth and related characteristics during development; (2) estimation of reliability parameters from mixed sources of data; and (3) reliability projection. During this quarter we added a fourth area of investigation: optimal procedures in the installation of spare parts. The emphasis in each area is on methodology, but real data will be sought to illustrate the methods developed.

ACTIVITY AND RESULTS

(1) Estimation of Reliability Growth and Related Characteristics During Development

During this reporting period we have developed general methods for constructing conservative confidence bounds and have applied them to models for reliability growth, for "debugging," and for "burn-in."

These methods and the maximum likelihood estimates mentioned in last quarter's report (AR-184-NASA) will be described and illustrated in several RAND Memoranda now in preparation.

(2) Estimation of Reliability Parameters from Mixed Sources of Data

Work on this study was begun during this quarter and will continue into the next reporting period.

We construe a development program as a network of jobs to be done. Testing is to be done at various points in the network to measure the reliability of the final product. Some tests will be performed at intermediate points of the network and some at the terminal point (tests on the finished product). Intermediate tests may be preferred to terminal tests, because the former may be a cheaper source of information. We are trying to obtain theoretical results and computational methods for optimal fixed-size and sequential testing plans in this context.

(3) Reliability Projection

Owing to increased efforts on the other problem areas, we were unable to start work on this study during the period.

(4) Optimal Procedures in the Installation of Spare Parts

The following described study will be documented in a forthcoming RAND Memorandum.

A device is to operate at one of two times in the future. The device is subject to random failure; repairing the device takes a fixed amount of time and uses up one spare part from a limited stock. Given the initial state of the device and the number of spare parts, we can determine the operating and replacement policy which maximizes the probability that the device will operate at one of the two specified times.

PROJECT PERSONNEL

Personnel active during this quarter were: Jon Folkman, Bennett Fox, Sidney Port, Ernest M. Scheuer, Richard E. Barlow (consultant), Frank Proschan (consultant), and Lawrence Bodin (personal services contract).